
Endocardial cells form the coronary arteries by angiogenesis through myocardial-endocardial VEGF signaling.

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Public Summary:

This article identifies a developmental origin of the inner lining (endothelium) of coronary arteries in the heart.

Scientific Abstract:

The origins and developmental mechanisms of coronary arteries are incompletely understood. We show here by fate mapping, clonal analysis, and immunohistochemistry that endocardial cells generate the endothelium of coronary arteries. Dye tracking, live imaging, and tissue transplantation also revealed that ventricular endocardial cells are not terminally differentiated; instead, they are angiogenic and form coronary endothelial networks. Myocardial Vegf-a or endocardial Vegfr-2 deletion inhibited coronary angiogenesis and arterial formation by ventricular endocardial cells. In contrast, lineage and knockout studies showed that endocardial cells make a small contribution to the coronary veins, the formation of which is independent of myocardial-to-endocardial Vegf signaling. Thus, contrary to the current view of a common source for the coronary vessels, our findings indicate that the coronary arteries and veins have distinct origins and are formed by different mechanisms. This information may help develop better cell therapies for coronary artery disease.

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